influence of impurity content on ion heat conductivity  
 in the t-10 tokamak plasma [[1]](#footnote-1)\*)

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During the campaigns of 2014-2018 experiments with various impurity content are carried out on T-10. The following regimes are obtained: with intrinsic light (“CO”) and heavy (“COW”) impurities, injected impurities (“He” and “Ne”), and fully lithium plasma (“Li”). In the current work, each of regimes is analyzed in ion power balance terms:

 (1)

where first term  is ion heat flux,  is total ion density (sum of deuterium and impurities), Г*i* is total ion particle flux,  is electron to ion heat transfer due to Coulomb collisions, *PCX* is charge exchange losses.

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| Figure. Dependence of ion heat conductivity at *r*/*a* = 0.65 versus the ratio *Ti*/*Te* |

For every discharge the values of ion heat conductivity, , on *r*/*a*=0.65 is determined from (1). In discharges with ohmic heating,  increases with the *Zeff* growth. For intrinsic impurities regimes it occurs together with decrease in *ni* due to the main gas dilution by impurities. For “He”, “Ne”, and “Li” regimes the increase of *Zeff*, in opposite, result in rise of  and *ni*. Moreover, the electron power balance changes and, consequently, *Te* changes.

Therefore, the change of impurity content result in complex variation of plasma parameters that can be generalized by considering a dependence of  on *Ti*/*Te*. Figure shows that the increase of *Ti*/*Te* leads to the decrease in . The excess over neoclassical values drops from the factor of ~2.5 down to ~1.5. Such dependences  on *Ti*/*Te* is usually associated with ITG mode stabilization with the increase of *Ti*/*Te* ratio [1].

References

1. S. Breton et al 2018 Nucl. Fusion 58 096003

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/Mu/ru/BE-Nurgaliev.docx) [↑](#footnote-ref-1)